ISSN 0097-4463

ANNALS
of CARNEGIE MUSEUM

CARNEGIE MUSEUM OF NATURAL HISTORY

4400 FORBES AVENUE • PITTSBURGH, PENNSYLVANIA 15213

VOLUME 48 1 June 1979 ARTICLE 6

PALEONTOLOGY AND GEOLOGY OF THE BADWATER CREEK AREA, CENTRAL WYOMING. PART 17. THE LATE EOCENE SNAKES

J. Alan Holman[1]

Abstract

Snake remains of Uintan mammal age (late Eocene) of the Badwater Creek area, central Wyoming are identified as *Dunnophis* sp., *Coniophis* sp., *Dawsonophis wyomingensis* n. gen. et sp., *Ogmophis voorhiesi*, and *Boavus* sp. *Dawsonophis* is a small boid snake quite distinct from fossil and living forms and of uncertain subfamilial relationships.

Introduction

Aside from scattered references to large sea snakes of the family Palaeophidae (Holman, 1979), late Eocene snakes are very poorly known. In fact, only one late Eocene snake fauna, a fauna from the Twiggs Clay in Georgia (Holman, 1977) has previously been reported. This fauna was of Duchesnean (latest Eocene) mammal age.

The present paper deals with snake remains from Locality 6 of the Badwater Creek area, Natrona County, Wyoming. Locality 6 is thought to represent the Uintan (earlier late Eocene) mammal age (Krishtalka and Setoguchi, 1977). Thus, the present paper is the first report of snakes of Uintan age in the New World. A Bridgerian (middle Eocene) mammal age snake fauna was reported by Hecht (1959). The material discussed in the present paper is housed in the collections of the Carnegie Museum of Natural History (CM).

[1] Address: The Museum, Michigan State University, East Lansing, Michigan 48824.
Submitted 15 November 1978.

ACKNOWLEDGMENTS

I wish to thank Dr. Mary Dawson of the Carnegie Museum of Natural History for the privilege of studying these snake fossils. Merald Clark made the drawings.

SYSTEMATIC PALEONTOLOGY

Class Reptilia
Order Squamata
Suborder Serpentes
Familia Incertae Sedis
Genus *Dunnophis* Hecht, 1959
Dunnophis sp. indet.

Material.—One fragmentary vertebra, CM 35003.

Remarks.—This tiny vertebra appears to represent the genus *Dunnophis* Hecht based on its short, knobbed, neural spine which is restricted to the posterior third of the dorsal portion of the neural arch. This fragmentary bone is much smaller and has a much larger neural canal than the nominate species *Dunnophis microechinis* from the middle Eocene of the Bridger Formation of the Tabernacle Butte area of Wyoming (Hecht, 1959).

Family Aniliidae
Genus *Coniophis* Marsh, 1829
Coniophis sp. indet.

Material.—Three fragmentary trunk vertebrae, CM 35004.

Remarks.—All of these fragmentary vertebrae lack distinct neural spines and appear to represent juvenile individuals of the genus *Coniophis*. These vertebrae are too incomplete for specific identification. Two species, *Coniophis carinatus* Hecht and *Coniophis platycarinatus* Hecht, are known from the Bridgerian (middle Eocene) of the Tabernacle Butte area of Wyoming (Hecht, 1959).

Family Boidae
Subfamilia Incertae Sedis
Dawsonophis, new genus

Diagnosis.—A distinctive genus of rather small (estimated length about 1.1 m) boid snake of uncertain familial relationships distinguished from other boid genera on the basis of the trunk vertebrae having (1) a long, low, neural spine about twice as long as its height, its anterior edge strongly curved anteriorly, and its posterior part swollen posteriorly and flattened dorsally; (2) a thin straight zygosphenal roof; (3) a depressed cotyle and condyle; (4) a strong oblanceolate hemal keel; and (5) a moderately vaulted neural arch.

Fig. 1.—Holotype trunk vertebra fused posteriorly with a very incomplete trunk vertebra of *Dawsonophis wyomingensis*, new genus and species, from the late Eocene of the Badwater Creek area, central Wyoming. Upper left dorsal, upper right lateral, middle ventral, lower left anterior, lower right posterior. The line equals 2 mm.

Dawsonophis wyomingensis, new species

Holotype.—CM 14444. A trunk vertebra fused posteriorly with a very incomplete trunk vertebra (Fig. 1).

Paratype.—A third trunk vertebra, CM 14445, collected by the same collectors at the same locality at the same time.

Horizon.—Late Eocene, Uintan Mammal Age, Hendry Ranch Member.

Locality.—SESE, S. 14, T. 39 N., R 89 W, Natrona County, Wyoming. Referred to as Locality 6.

Collectors.—Craig Black, Mary Dawson, and Peter Robinson in 1962.

Etymology.—The name recognizes Dr. Mary Dawson for her contributions in vertebrate paleontology. The specific name refers to the state where the fossil material was collected.

Description of the holotype.—In dorsal view, the vertebra is wider than long. The anterior border of the zygosphene is straight. The neural spine is long and is over one-half the length of the distance between the posterior edge of the neural arch and the anterior edge of the cotyle. The neural spine is swollen posteriorly with the swollen portion being flattened dorsally. The neural spine is about twice as long as it is high. The prezygapophyseal articular facets are broken off. Nevertheless, the fragmentary vertebra that is articulated posteriorly shows, in dorsal view, a partially visible right prezygapophyseal facet which appears to be ovoid in shape. The accessory process of this facet is rounded and poorly developed.

In lateral view, the neural spine is long and low, being about twice as long as it is high. Its anterior edge is strongly curved anteriorly. The posterior part of the neural arch is upswept. The subcentral ridges are moderately curved upward.

In ventral view, the hemal keel is very well-developed and strong and has deep grooves between it and the subcentral ridges. The hemal keel is oblanceolate in shape (see Auffenberg, 1963: 153, fig. 1). The paradiapophysis is not strongly divided into parapophyseal and diapophyseal portions.

In anterior view, the zygopophyseal area is moderately thick. The upper border of the zygosphene is flat. The neural canal is rhomboidal in outline and filled with cemented matrix. The cotylar area inscribes about one-fourth more area than the area inscribed by the neural canal outline. The cotyle is depressed. In posterior view, the neural arch is moderately vaulted.

Measurements of the holotype are as follows: length of vertebra from cotylar border through posterior edge of neural arch, 6.9 mm; dorsal view length of neural spine, 3.7 mm; estimated anterior width of vertebra, 9.2 mm; height of vertebra from bottom of hemal keel through top of neural spine, 7.2 mm.

Paratype.—The paratype (Fig. 2) may be from a more anterior portion of the trunk than the holotype in that the hemal keel is wider and not nearly as oblanceolate in shape as in the holotype. This type of change in vertebral proportions toward the anterior end of the snake vertebral column is shown in Hoffstetter and Rage (1972: 21, fig. 7b and c). The vertebra is very fragmentary, but it is about the same size as the holotype, shows the depressed cotyle and condyle, and has a moderately vaulted neural arch.

Remarks.—*Dawsonophis* is here compared with several genera of fossil boids of similar vertebral form. It can be distinguished from all of these on the basis of its depressed cotyle and condyle.

It may be separated from *Pseudoepicrates stanolseni* (Vanzolini) of the early middle Miocene of Florida on the basis of the much lower neural spine and much less massive zygosphene in *Dawsonophis* (*Pseudoepicrates* is illustrated in Auffenberg, 1963: 160, fig. 8).

Dawsonophis may be separated from *Ogmophis compactus* Lambe of the lower Oligocene of Saskatchewan on the basis of its less well-developed accessory processes and its oblanceolate hemal keel. *Ogmophis compactus,* a very distinctive large form of paraphyletic *Ogmophis,* has relatively well-developed accessory processes for a boid (Holman, 1972: 1625, fig. 6) and a hemal keel that is of uniform width throughout its length.

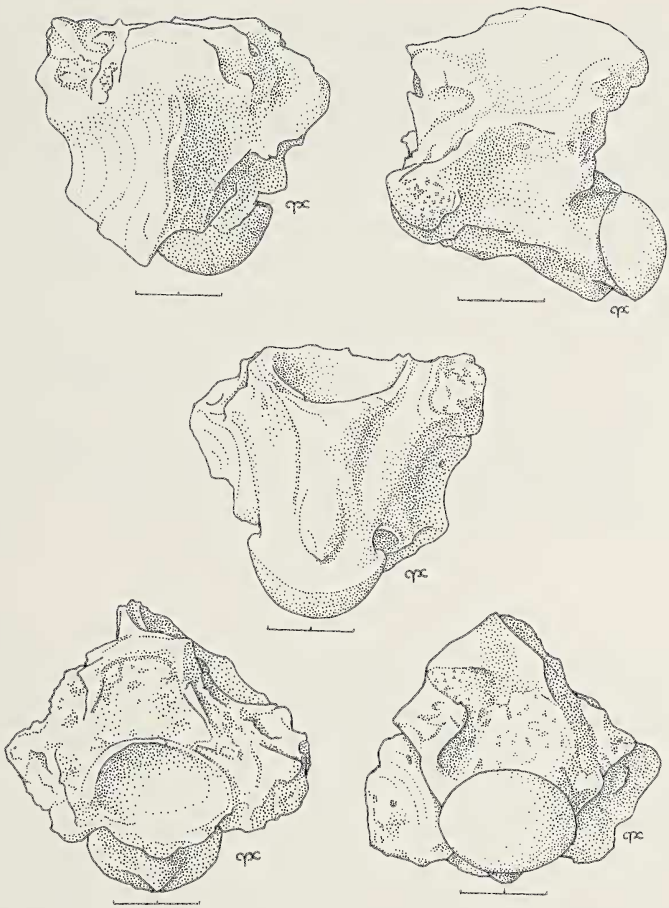

Fig. 2.—Paratype vertebra of *Dawsonophis wyomingensis*, new genus and species, from the late Eocene of the Badwater Creek area, central Wyoming. Upper left dorsal, upper right lateral, middle ventral, lower left anterior, lower right posterior. The line equals 2 mm.

Dawsonophis may be separated from *Palaeopython* de Rochebrune, which has several species in the Eocene and Oligocene of Europe, on the basis of its differently shaped neural spine and much less massive zygosphene (*Paleopython filholi* de Rochebrune is illustrated in Rage, 1974: 286, fig. 3).

Dawsonophis may be separated from *Huberophis georgiensis* Holman of the late Eocene of Georgia on the basis of the much longer

neural spine, the oblanceolate hemal keel, and the shorter vertebra (*Huberophis* is illustrated in Holman, 1977: 143, fig. 2).

Dawsonophis may be separated from *Paraepicrates brevispondylus* Hecht from the middle Eocene of Wyoming on the basis of the differently shaped neural spine and its oblanceolate hemal keel. *Paraepicrates* has a much shorter hemal spine and a wider, less distinct hemal keel (Hecht, 1959: plate 55).

Finally, *Dawsonophis* may be separated from *Boavus* Marsh, which has several species in the Eocene of Wyoming, on the basis of the differently shaped neural spine, oblanceolate hemal keel, and much less massive zygosphene. The neural spine of *Boavus* is much higher and shorter, the hemal keel narrower, and the zygosphene massive. Several species of *Boavus* have their vertebrae illustrated in Gilmore, 1938.

It seems quite possible that the very distinctive boid genus *Dawsonophis* might represent an undescribed boid subfamily, but one hesitates to describe a subfamily on trunk vertebrae alone.

Subfamily Erycinae

Genus *Ogmophis* Cope, 1884

Ogmophis voorhiesi Holman, 1977

Material.—Two trunk vertebrae and the consolidated tip of the tail consisting of several fused caudal vertebrae, CM 35005.

Remarks.—As several authors have commented, the status of the genus is questionable and it probably will not become clear until more complete fossil skeletons are recovered. Based on its small size, the shape of the long neural spine in dorsal view, the wide hemal keel, and the somewhat indistinct subcentral ridges, the trunk vertebrae are assigned to *Ogmophis voorhiesi,* a form previously known only from a single vertebra from the upper Eocene Twiggs Clay, Twiggs County, Georgia. The wide range of this species in the late Eocene is of considerable interest and one wonders if it indicates similar climates in the two areas.

The recovery of the fused caudal vertebrae representing the solid, blunt tail-tip is of special importance as it indicates that *O. voorhiesi* is unquestionably a member of the subfamily Erycinae (see Hoffstetter and Rage, 1972: 7).

Measurements of the Wyoming vertebrae compared with the holotype specimen are as follows: greatest length of centrum from paradiapophyses through the centrum ranges from 2.2 to 2.5 mm (3.0 mm in type); neural spine length in most complete Wyoming specimen is 1.1 mm (1.2 mm in type); length of the consolidated tip of the tail composed of fused caudal vertebrae is 4.4 mm (unknown in type).

Subfamily Boinae
genus et sp. indet.

Material.—Fragmentary trunk vertebra, CM 35006.

Remarks.—This vertebra lacks many diagnostic features as the posterior portion of the centrum is missing and the prezygapophyses are broken. But the vertebra appears to be from a very distinctive form with a very robust neural spine and hemal keel. It is very possible that this specimen represents a new form.

Genus *Boavus* Marsh, 1871
Boavus sp. indet.

Material.—A fragmentary trunk vertebra, CM 35007.

Remarks.—The single vertebra appears to represent the genus *Boavus* and it differs from *Paraepicrates* Hecht of the Bridgerian (middle Eocene) Tabernacle Butte area of Wyoming in having a much thinner hemal keel. The Badwater Creek specimen is too fragmentary for specific identification. Hecht (1959) reports this genus from the Bridgerian (middle Eocene) Tabernacle Butte area of Wyoming.

DISCUSSION

The study of late Eocene snakes is yet in its infancy as only two small faunas are known—the Badwater Creek fauna of Wyoming discussed herein and thought to represent the Uintan (earlier late Eocene) mammal age, and the Twiggs Clay fauna of Georgia (Holman, 1977) thought to represent the Duchesnean (latest Eocene) mammal age. Although both faunas are represented only by primitive snakes (Infraorder Henophidia), there are few taxonomic resemblances beyond this point. The only taxon shared by the two faunas is the erycinine boid *Ogmophis voorhiesi*.

It is interesting to note that the Badwater Creek fauna shares three genera—*Coniophis*, *Dunnophis*, and *Boavus*—in common with the Bridgerian (middle Eocene) mammal age Tabernacle Butte area fauna of Wyoming (Hecht, 1959) that are not found in the Twiggs Clay fauna of Georgia. I suspect that rather than being of stratigraphic importance, this situation reflects regional and ecological differences. The paleoenvironment for the Twiggs Clay area during Duchesnean times is thought to have been of a tropical estuarine nature.

LITERATURE CITED

AUFFENBERG, W. 1963. The fossil snakes of Florida. Tulane Studies Zool., 10:131–216.

GILMORE, C. W. 1938. Fossil snakes of North America. Geol. Soc. Amer., Spec. Paper, 9:1–96.

HECHT, M. K. 1959. Amphibians and reptiles. Pp. 130–146, *in* The Geology and Paleontology of the Elk Mountain and Tabernacle Butte Area, Wyoming (P. O. McGrew, ed.), Bull. Amer. Mus. Nat. Hist., 117:121–176.

HOFFSTETTER, R., AND J. C. RAGE. 1972. Les Erycinae fossilies de France (Serpentes, Boidae) comprehension et histoire de la sous-famille. Ann. Paleontologie (vertebres), 58:81–129.

HOLMAN, J. A. 1972. Herpetofauna of the Calf Creek local fauna (lower Oligocene: Cypress Hills Formation) of Saskatchewan. Canadian J. Earth Sci., 9:1612–1631.

———. 1977. Upper Eocene snakes (Reptilia, Serpentes) from Georgia. J. Herpetology, 11:141–145.

———. 1979. A review of North American Tertiary snakes. Publ. Mus. Michigan State Univ., Paleont. Ser., in press.

KRISHTALKA, L., AND T. SETOGUCHI. 1977. Paleontology and geology of the Badwater Creek area, Central Wyoming. Part 13. The late Eocene Insectivora and Dermoptera. Ann. Carnegie Mus., 46:71–99.

RAGE, J. C. 1974. Les serpentes des phosporites du Quercy. Palaeovertebrata, 6: 274–308.